EARTH SYSTEM SCIENCE PATHFINDER (ESSP)

SPACE SHUTTLE LAUNCH OPPORTUNITIES

Space Shuttle Use

The Space Shuttle may be used to launch an ESSP payload if such use is consistent with Public Law 101-611 as excerpted below.

This document is divided into three Sections:

1. Space Shuttle Use Policy (note that these criteria do not have to be met for secondary payloads).
2. General Capabilities and Requirements of the Space Shuttle.
3. ESSP AO Proposal Requirements for Use of the Space Shuttle.

Section 1 -- Space Shuttle Use Policy

The Space Shuttle Use Policy articulated in the Fiscal Year 1991, NASA Authorization Act, Section 112 states the following:

> *SEC. 112. SPACE SHUTTLE USE POLICY*
>
> *(a) (1) It shall be the policy of the United States to use the Space Shuttle for purposes that (i) require the presence of man, (ii) require the unique capabilities of the Space Shuttle, or (iii) when other compelling circumstances exist.*
>
> *(2) The term "compelling circumstances" includes, but is not limited to, occasions when the Administrator determines, in consultation with the Secretary of Defense and Secretary of State, that important national security or foreign policy interests would be served by a Shuttle launch.*
>
> *(3) The policy stated in subsection (a) (1) shall not preclude the use of available cargo space, on a Space Shuttle mission otherwise consistent with the policy described in the subsection (a) (1) for the purpose of carrying secondary payloads (as defined by the Administrator) that do not require the presence of man if such payloads are consistent with the requirements of research, development, demonstration, scientific, commercial, and educational programs authorized by the Administrator.*

Additionally, Section 204 of Title II of the Act, requires NASA to use commercial launch services for primary payloads with certain exceptions, including an exception for use of the Space Shuttle.. Section 204 is repeated here.

Title II - Commercial Launch Services Purchase Act of 1990

SEC. 204. REQUIREMENT TO PROCURE COMMERCIAL LAUNCH SERVICES

(a) IN GENERAL - Except as otherwise provided in this section, the National Aeronautics and Space Administration shall purchase launch services for its primary payloads from commercial providers whenever such services are required in the course of its activities.

(b) EXCEPTIONS - The National Aeronautics and Space Administration shall not be required to purchase launch services as provided in subsection (a) if, on a case by case basis, the Administrator of the National Aeronautics and Space Administration determines that-

(1) the payload requires the unique capabilities of the Space Shuttle;
(2) cost effective launch services to meet specific mission requirements are not reasonably available and would not be available when required;
(3) the use of commercial launch services poses an unacceptable risk of loss of a unique scientific opportunity; or
(4) the payload serves national security or foreign policy purposes.

Purposes that Meet the Policy

The use of the Space Shuttle will be restricted to only those primary payloads whose purposes are consistent with the above-stated policy. Payloads that are assigned to the Shuttle based on the first two of the three criteria of Section 112 of the Act will be so assigned primarily due to their physical/functional characteristics and/or operational needs. The third criterion will involve factors such as national security and foreign policy considerations, etc. Note that these criteria do not have to be met for secondary payloads.

The following is a listing of examples of the purposes that are considered to meet the three criteria. This listing is representative and not considered inclusive. For payloads assigned to the Shuttle where the basis is other than that it requires the presence of man, the specific justification will be included in NASA's annual report to Congress.

Examples of Purposes Requiring the Presence of Man:

· Scientific observation
  - Observation/description of phenomena
  - Real-time data evaluation, correlation with other data
  - Pointing of observing/measuring instruments at phenomena of interest
  - Adjusting of instrument parameters (turning, filter selection, gain, levels, etc.) for optimum observations

- Skilled instrument operation
  - Calibration
  - Removal/reloading of film, reagents, etc.
  - Maintenance/repair
  - Monitoring of operations
- Crew-related life sciences/medical experiments
- Operation of Shuttle and Shuttle Systems
  - Shuttle maneuvers for payload requirements
  - Remote manipulator system operations
  - Control and monitoring of support functions (power, cooling, etc.)
- Servicing or repair of an orbiting payload
- Extravehicular activity (EVA)
- Pre-deployment checkout/status verification

Examples of Purposes Requiring Unique Shuttle Capabilities:

- Return of a payload to Earth
  - Recovery of product or specimens for analysis, further processing or distribution
  - Return of high value hardware for reuse
  - Retrieval of payloads from orbit
- Accommodation of size and/or weight of large payload

Examples of Other Compelling Circumstances:

- National security or foreign policy considerations
- Launching of an ELV would result in an unacceptable risk of loss of a unique scientific opportunity
- ELV launch services would not be available when required
- Cost-effective ELV launch services to meet specific mission requirements are not reasonably available.

Section 2 -- General Capabilities and Requirements of the Space Shuttle

The Space Shuttle offers unique opportunities to launch payloads that are large, heavy and/or require recovery. It can also carry small payloads on a space-available basis. Since secondary payloads share the mission with other payloads, the resources and capabilities of the Space Shuttle are shared among all payloads on a mission. Experiments can be conducted on a free flyer. Free flyers can be either dedicated satellites or carriers, to which the instrument mounts, which, in turn, interface with the Orbiter. The capabilities and resources available to the experimenter are the combination of the instrument/carrier design and the portion of Shuttle resources allocated to that payload.

Payload Size

While the capacity of the Space Shuttle is in excess of 32000 pounds, secondary payloads generally do not exceed 8000 pounds. Similarly, the shuttle payload bay volume (15' dia. x 60' long) is shared among the entire payload complement. Instrument size, shape, and mass are driven by the capabilities of the carrier within the constraints of the Shuttle and the other manifested payloads.

Orbits

The Shuttle can carry payloads into orbits with an inclination ranging from 28.5 degrees to 57 degrees. Altitudes at which free flyers can be deployed depend on a variety of factors but can vary from 110 nmi to over 300 nmi. Free flyers can carry orbit adjust systems to modify orbit parameters.

Mission Duration

Shuttle launched mission duration varies depending on the mission design. Mission designs can include deployment and retrieval on the same Shuttle mission, deployment on one mission and retrieval by a later mission, or deployment and no retrieval.

Payloads and spacecraft that are deployed and retrieved on the same mission are generally constrained to two weeks or less. Spacecraft not retrieved on the same mission as deployment can remain in space for periods ranging from months to years.

Environment

Launch, orbital, and landing environments are driven by a combination of the Shuttle environment, the presence of other payloads in the bay, and the instrument/carrier design. Specific environments are available from spacecraft and carrier providers.

Payload/Launch Vehicle Integration and Launch

Integration of the payload with the Space Shuttle will be accomplished at the Kennedy Space Center in Florida. The proposer's launch site integration and testing team will work with the KSC ground operations team during the integration of the flight payload, and its ground systems, with the Shuttle and its associated GSE.

Shuttle Safety

When the proposed mission is a Shuttle payload the proposer is required to plan and implement a system safety program that meets all Space Shuttle safety requirements imposed by the Johnson Space Center for NSTS payloads. The controlling safety documents are (NHB) 1700.7, Safety Policy and Requirements for Payloads Using the Space Transportation System; and (KHB) 1700.7,

"STS Payload Ground Safety Handbook". The Space Shuttle Program typically requires 3 safety reviews. Proposers are advised that Space Shuttle safety requirements are particularly strict and may lead to unexpected design changes, additional test or analysis requirements, and associated cost increases. These can be mitigated significantly by early involvement with the Shuttle Safety Office, however, higher contingency levels are recommended for Shuttle based missions.

Section 3 -- ESSP AO Proposal Requirements for Use of the Space Shuttle

Proposals in response to the 1998 ESSP Announcement of Opportunity (AO-98-OES-01) that are proposing the use of the Space Shuttle must provide the launch vehicle information required by the AO. In general the proposal must have sufficient documentation to convince the review panel of the viability of the proposed mission, technically and programmatically, and also in terms of cost, schedule risk and cost reserve.

The point of contact for the NASA Space Operations Utilization Office listed below will provide information to assist proposers in developing the cost and risk information required for the proposal.

ESSP Proposal Launch Cost Requirements

The proposed launch cost for proposals intending to use the space shuttle must separately identify the Space Shuttle Launch Service Costs and the Mission Unique Space Shuttle Launch Costs. Proposers should contact the NASA Space Operations Utilization Office Point of Contact for more information on these costs, briefly described below:

1. The Space Shuttle Launch Services Costs: The NASA Office of Space Flight Point of Contact listed below will provide these costs, which will not be charged to the ESSP program but must be included in the NASA Mission Cost (NMC) for the purposes of evaluation only.

2. The Mission Unique Space Shuttle Launch Costs: These costs are to be developed by the proposal team. Specifically, the mission unique costs include carrier, integration and test, interface, documentation and other mission unique requirements such as upper stage(s) costs if any. In addition, the costs of completing development of a carrier, if such a carrier will be used for the first time should be included and specifically identified as part of the spacecraft cost.

ESSP Proposal Launch Risk Requirements

The proposal must have sufficient documentation to convince the review panel of the viability of the mission in terms of launch schedule risk and related cost reserves. To facilitate development of this information, the proposer should contact the NASA Space Operations Utilization Office Point of Contact who will assist by identifying the Space Shuttle manifest opportunities appropriate for

the proposed mission. Typically, NASA does not initiate the formal Space Shuttle manifesting process until after a proposal is selected for flight.

Point of Contact

Proposers wishing to utilize the Space Shuttle should contact:

Robert Elsbernd
NASA Space Operations Utilization Office
Code MO, NASA Headquarters
Washington, DC, 20546-0001
Phone Number: (202-358-4417)
E-mail Address: robert.elsbernd@hq.nasa.gov

The following are the additional sources of information for the various Shuttle launch options:

Proposers considering NASA Shuttle attached and/or free flying carriers should contact the Shuttle Small Payloads Project Manager, Mail Code 870, NASA Goddard Space Flight Center, Greenbelt, MD 20771; contact SSPP Project Manager (301) 286 4271 for additional information and guidance.

For dedicated satellites, proposers should contact Space Operations Utilization Office, Code MO, NASA Headquarters, Washington, DC 20546-0001; contact Robert Elsbernd (202-358-4417), E-mail address robert.elsbernd@hq.nasa.gov. Robert Elsbernd is also the point of contact for Shuttle manifesting opportunities.

For specific technical inquiries regarding Shuttle, contact the Space Shuttle Customer and Flight Integration Office, Code MT, NASA Johnson Space Flight Center, Houston, Texas 77058-3696; contact Michele Brekke (281-483-4614), E-mail address: michele.a.brekke1@jsc.nasa.gov.